EuCARD Task 10.4

Sergio Calatroni

Sub-task 10.4.1

New and improved techniques for the production of Nb sputtered Quarter Wave (QW) cavities (CERN, INFN-LNL)

QW cavities are highly suitable for heavy ion SC linacs, which today are used (or widely proposed to be used) for applications such as accelerators for radioactive ions beams, for low energy injectors and other ion beam applications.

The work, led by CERN in collaboration with INFN-LNL, will focus on magnetron sputtering, high peak power magnetron sputtering and better shaping (techniques) of the cavities.

The target value is to reach accelerating field of 6 MV/m with a Q-value of at least $5*10^8$.

Sub-task 10.4.2

Arc coating of super conducting photo-cathodes (DESY, IPJ)

Metallic superconducting photo cathodes in superconducting RF guns have a long life time and avoid the severe problem with contamination related to the exchange and conditioning required for a normal warm photo cathode.

The work will focus on the coating of SC photocathode with a highly emission efficient lead layer with the goal of reaching a quantum efficiency of 3 10^{-3} for 213 nm wavelengths. The plan is to demonstrate operation of it in two high purity Nb cavities with a field of 40 MV/m at the emitting spot.

The work is lead by DESY with the arc sputtering of lead performed by IPJ-Swierk.

Sub-task 10.4.3

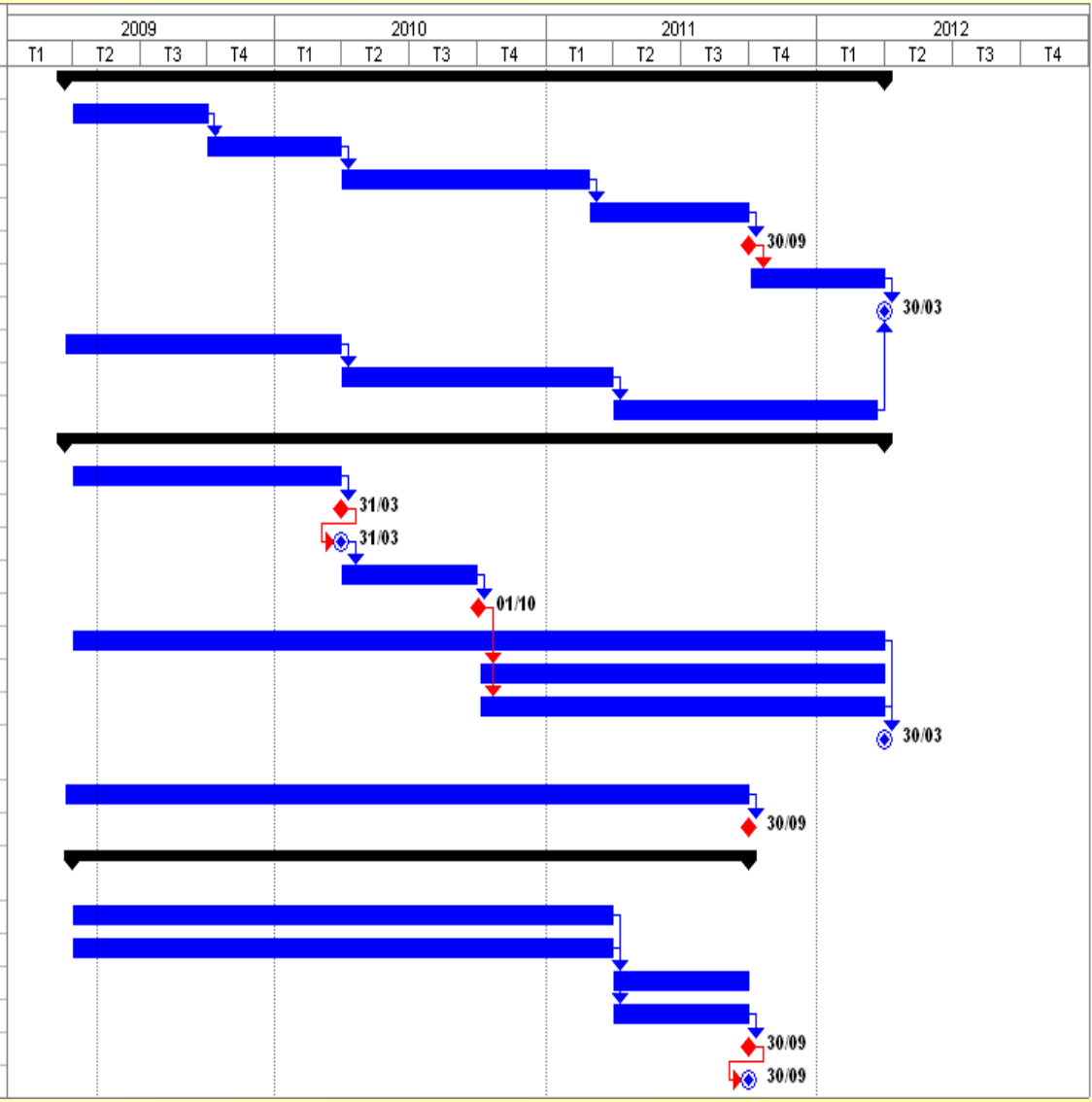
Novel thin film techniques for SCRF

(CI, CEA, LNL, CERN, IPNO-IN2P3)

The development in thin film techniques is making steady progress and there are new developments of techniques such as atomic layer deposition (ALD), which appear versatile enough to be applied for the manufacturing of SC cavities. The work, led by CI in collaboration with CEA, LNL, CERN, and IPNO-IN2P3 will cover experimental studies of new methods for thin film deposition and the characterization of RF properties of the films which will be performed with resonators for sample tests (e.g. TE011 cylindrical bulk niobium cavity, quadrupole resonator, etc.) using the thermometric/calorimetric method.

WP10.4: Planning

N°	Task Name
1	**Sub-Task 4.1: Improve the Nb sputtering technology for low beta cavities**
2	Study of magnetron assembly for prototype QWR of small size
3	Mechanical design of magnetron assembly, for small QWR
4	Construction of magnetron assembly
5	Study of sputtering parameters
6	**Milestone 10.4.3: QWR sputtering with Nb using the magnetron technique**
7	Optimisation of deposition inside small QWR
8	**DELIVERABLE 10.4.2: RF measurements on thin film deposited QWR prototype**
9	Purchase of HiPIMS (pulsed sputtering) power supply
10	Sputter parametr optimisation on samples
11	Test coatings on HIE-ISOLDE QWR cavity
12	**Sub-Task 4.2: Perform arc sputtering of photo-cathodes (Pb).**
13	Construction of planar pulsed arc biased deposition system
14	**Milestone 10.4.1: Lead deposition on samples for photocathode development**
15	**DELIVERABLE 10.4.1: QE data for Pb/Nb deposited photo cathode samples**
16	Adaptation of deposition system for half cell and 1.5 cell cavities
17	**Milestone 10.4.3: Lead deposition of half cells and 1.5 cell cavities**
18	Cold test of SRF cavities before Pb deposition
19	Optimisation of Pb deposition in SRF cavities
20	Cold Test of SRF cavities after Pb deposition
21	**DELIVERABLE 10.4.3: Cold test results for the cavities with and without the deposited Pb cathode**
22	Optimisation of RF design of the 1.5 cell injector cavity
23	**Milestone 10.4.5: Improved RF design of 1.5 cell**
24	**Sub-Task 4.3: Research on new technologies for thin film depositing of superconductors for SC cavity applications**
25	Development of ALD samples by CEA
26	Study of proximity effect on HTS by Cu coatings
27	RF characterisation using INPNO RF thermometric measurements
28	RF characterisation using CERN quadrupole resonator
29	**Milestone 10.4.5: Report on new thin film coating techniques for SC cavities**
30	**DELIVERABLE 10.4.4: New thin film techniques for SC cavities and photocathodes**



WP 10.4: deliverables and milestones

Deliverables of tasks	Description/title	Nature	Delivery month
10.4.2	RF measurements on thin film deposited QWR prototype	R	M36
10.4.3	Cold test results for the test cavities w/out the deposited lead photo cathode	R	M36
10.4.4	New thin film techniques for SC cavities and photo cathodes	D	M30

Mile-stone	Description/title	Nature	Delivery month	Comment
10.4.3	QWR sputtering with Nb using the magnetron technique	P	M30	
10.4.4	Report on new thin film coating techniques for SC cavities	R	M30	
10.4.5	Improved RF-design of 1.5 cell	R	M30	

Meetings:
IPNO 4/2009 (kickoff)
SRF2009 Berlin
Thin Films Workshop Legnaro (2010)

Today

Task 10.4 "Thin Films" Reports (17:00 ->19:00)	
17:00	
Status of coatings for HIE-ISOLDE (20')	Mathieu Therasse (CERN)
17:20	
Status of Pb/Nb coatings for photocathodes (20')	Robert Nietubyc (Institute for Nuclear Studies)
17:40	
Status of Nb coatings with the HIPIMS technique (20')	Sergio Calatroni (cern)
18:00	
Enhancement of First Penetration Field in Superconducting Multi-layers Samples 20')	Claire Antoine (cea)

WP 10.4: budget

Beneficiary short name [a]	Average direct monthly salary * (€)	Rate for personnel indirect costs (%)	Rate for material and travel indirect costs (%)
CI	6'200	60	60
CEA	6'200	63	0
CERN	6'200	60	60
CNRS/IPNO	4'972	60	60
DESY	6'200	60	60
INFN/LNL	5'200	60	60
IPJ Swjerk	5'200	60	60
...			
...			

22.07.2008 07:37 New numbering

23.07.2008 17:03 On request by D. Proch, EC request is now the Feb EC request reduced by 29.741 %

* To prevent rounding problems on the cost data, give the monthly salary as a multiple of 100 €

[a] In alphabetic order

Beneficiary short name (all costs in €)	Person-Months	Personnel direct costs	Personnel indirect costs	Sub-contracting cost	Consumable and prototype direct costs	Travel direct costs	Material and travel indirect costs	Total direct costs	Toal indirect costs	Total costs (direct +indirect)	EC requested funding[1]
CI	1.5	9'300	5'580	0	6'100	8'000	8'460	23'400	14'040	37'440	13'120
CEA	1.5	9'300	5'859	0	6'100	8'000	0	23'400	5'859	29'259	9'845
CERN	12	74'400	44'640	0	66'000	20'000	51'600	160'400	96'240	256'640	75'222
CNRS/IPNO	1.5	7'458	4'475	0		13'000	7'800	20'458	12'275	32'733	13'120
DESY	9	55'800	33'480	0	50'000	15'000	39'000	120'800	72'480	193'280	57'230
INFN/LNL	18	93'600	56'160	0	46'600	21'000	40'560	161'200	96'720	257'920	76'065
IPJ Swjerk	9	46'800	28'080	0	51'000	15'000	39'600	112'800	67'680	180'480	70'260
...		0	0	0	0	0	0	0	0	0	0
...		0	0	0	0	0	0	0	0	0	0
Totals:	53	296'658	178'274	0	225'800	100'000	187'020	622'458	365'294	987'752	314'862
FIXED TARGETS										995'400	315'700
CHECKING THE CONDITION										OK	OK

[1] In principle 30% of total costs

Material cost = consumable + prototype costs (assuming there are no durable equipment submitted to depreciation)

Personnel costs = person-months * monthly direct salary (inclusive contributions to social and other benefits)

Sub-contracting => note: subcontracted items do not give rise to reimbursement of overheads

Note: for TA and NA full-rate overheads have to be decalred according to the 1st table. EC nonetheless re-imburses 7% for these activiti

=> with the EU funding requested in the 2nd Table, it is possible to pay for more person-months than listed